

Introduction to Program Risk Management

Risk management is concerned with the systematic process, all plans and actions taken to: identify, analyze, prioritize, mitigate, monitor and report program risk which threatens attainment of program cost, schedule and performance objectives.

Terms and Definitions

Acquisition Risk - A measure of the inability to achieve program objectives within defined cost and schedule constraints. Risk is associated with all aspects of the program, e.g., threat, technology, funding, design processes, Work Breakdown Structure elements, etc. A risk event has two components: The probability of failing to achieve a particular outcome and the consequences of failing to achieve that outcome.

Risk Planning - The process of developing an organized, comprehensive and interactive approach tailored to identifying, assessing, mitigating and continuously tracking, controlling and documenting acquisition risk.

Risk Assessment - The process of identifying program risk events within risk areas and critical technical processes, analyzing them for their consequences and probabilities of occurrences and prioritizing them for handling.

Risk Identification - A process to examine each program area and critical technical process to identify the associated risks.

Risk Handling - A process that identifies, evaluates, selects and implements risk handling options that reduce risk to acceptable levels within established program criterion. e.g. the best cost/benefit ratio.

Risk Handling Options - Controlling, Assuming, Avoiding, and Transferring of risk. Also includes additional Research and Analysis of risk which may be a predecessor to implementing one or a combination of the others.

Areas/Sources of Risk.

- *Requirement.* Changes in the threat or a poorly defined requirement can result in redefinition of program performance objectives.
- *Funding.* Instability of funding tends to disrupt program schedules, performance requirements, and increase development cost.
- *Contractor.* Programs are subject to potential inability to meet cost, schedule and performance objectives when anything that affects the ability of the contractor to function occurs, such as labor strikes or financial difficulties.
- *Technology.* Technology risks result from the insufficient development of immature technologies to achieve previously unattained performance levels.
- *Design and Engineering.* Design and engineering risks are associated with the inability to translate technological capabilities into reliable hardware and software configurations.
- *Manufacturing.* Manufacturing risks reflect the to build the designed system to meet performance requirements.
- *Support.* Support risks are those associated with achieving reliability, availability, and system sustainment objectives.
- *Cost and Schedule.* The accuracy of the cost and schedule estimating process, and their supporting assumptions, impact the level of cost and schedule risks. Cost and schedule risk can also be increased by the cumulative impact of mitigating other sources of risk. Based upon the interrelationships between system components and WBS elements, there usually is a cost and schedule impact from implementation of risk handling options. This cumulative impact can roll up into cost and schedule risk at the acquisition program baseline level.

Risk Management and Program Management

The basic responsibility of the program manager is to achieve his or her program performance objectives within cost and schedule limits. It would be nice if all we had to do to accomplish this was to carefully execute the acquisition strategy. It isn't that easy. Acquisition is an inherently uncertain and risky business. Managing risk is a basic responsibility of every program manager. Every program has risk. Some PMs believe program management is risk management.

Since program risk is directly related to the uncertainty in the program's ability to meet cost, schedule, and performance objectives, it can only be measured relative to these objectives, and within the context of the program's acquisition strategy. Change the strategy and you change the risk. Unrealistic program strategies can infuse as much if not more risk into a program as using advanced technologies. Development of a realistic plan that recognizes and accounts for program risk is, by far, the most effective risk management technique and it must be an integral and continuing part of the general program planning and control processes.

For a manager to best manage risk, he or she must understand:

- What adverse events may occur within an acquisition program..
- The likelihood (probability) of the event occurring.
- The severity of impact upon obtaining program cost, schedule, and performance thresholds and objectives.

Given this level of understanding, the manager is able to handle or mitigate the risk by:

a. **Control** the risk by making it less likely the risk event will occur, or affect the impact of the event upon cost, schedule and performance of the program to minimize the damage to within acceptable levels.

b. **Assume** the risk as reasonable given the cost, schedule and performance context of the acquisition strategy and program requirements.

c. **Avoid** the risk by using an alternative path on the decision tree.

d. **Transfer** the risk to another party such as in the case of contract warranties or fixed price contracts.

e. Conduct further **research and analysis** to refine the uncertainty of the risk prior to migrating to another risk handling option.

Government and Contractor Roles in Program Risk Management

Prior to program initiation and contractor source selection, the Government's initial risk management role is to define the requirement, choose the best system concept that satisfies that requirement, and define the initial acquisition strategy to implement the system concept. In doing this, the Government is establishing the fundamental risks that will challenge that program. It may also be laying out the basic risk management approach the program will take as well as how the risk will be allocated between itself and the contractor.

Industry participation and input to the risk management process is a must! The draft Request for Proposal (RFP), provides opportunity for industry comments prior to milestone I and is one of the best tools to facilitate early industry influence in the program. After source selection, the contractor will be closest to the actual development work and should have already completed significant risk management activities prior to bidding and accepting the contract. As the program matures, the contractor role on risk management should expand to a reasonable level of control.

Risk Management Process

Although the risk management process model is presented in linear fashion as a simplification, some of the process steps may occur simultaneously. This generic model applies to any risk management situation.

At the top level, the model is based on a simple phased sequence of risk management actions (figure 1 below). First, we organize and prepare the program management office for the effort (**Planning/Preparation**). Second, we identify and analyze the risk events, their probability of occurrence and severity of consequence within the context of the acquisition strategy (**Assessment**). Third, we identify and implement specific responses to these risk events and choose those that are best for mitigating their impact on the program (**Handling**). Fourth, we monitor the status of the entire program, as well as the specific responses to our mitigation efforts, to determine if they are effective. (**Monitoring/Reporting**). Since the risk management process is iterative in nature, these management actions will need to be repeated as the program evolves and we continually refine and mature our acquisition strategy and program execution.

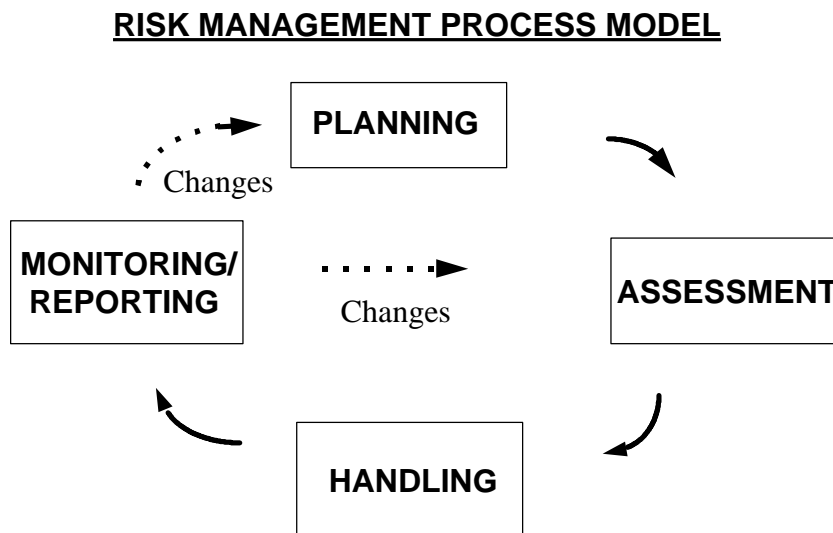


Figure 1

Risk Management Planning/Preparation

- Define the program's situation in terms of the resources, time, and expertise available to support risk management, and the types of risk with which the assessment team will be working.
- Identify, evaluate, and choose those risk management tools and techniques that are feasible and which best support program needs.

- Organize and train to ensure consistent assessments of program risks in a format supporting program management. This training is more important than most people realize. Unless everyone on the IPTs conducting risk assessments uses the same definitions, and comparable criteria for identifying and quantifying risks, it will not be possible to compare, rank, and consolidate them effectively.
- Establish schedule, budget, and appropriate controls to bring the risk management products in when they are needed.
- Establish a Management Information System (MIS) to document the analyses and decisions as they occur and to disseminate them as needed so they can be integrated.

Risk Assessment

- Identify and describe events or circumstances having adverse effects.
- Analyzing them to determine their likelihood of occurrence and their consequence on cost, schedule, and performance effects.
- Rank and integrating the events to produce an assessment for each element. The elements are cumulated/“rolled-up” to higher levels until ultimately a program level assessment is achieved.

Risk Handling

The objective of this process step is to identify the potential risk handling options for dealing with the risk event under consideration. Each of the five categories for risk handling options should be considered:

1. *Risk Control.* Risk control options establish fall-back positions to minimize the effects of a risk event should it occur, as well as a control system that allows the manager to institute the fall-back option in time. As an example, a parallel development effort might allow the program to attain performance objectives if a primary effort fails. Any method to reduce probability of occurrence and severity of consequence can be considered a control handling option.
2. *Risk Assumption.* Accept the risk without reducing either the probability or the severity of the consequence. This approach usually calls for cost, schedule, or performance “trade space” within the baseline thresholds and objectives that can be used if the risk event occurs.
3. *Research and Analysis.* Since risk is a function of probability and consequence, additional research and analysis (R&A) provides an opportunity to reduce the uncertainty associated with each identified risk event. R&A also identifies unknown risk events previously undiscovered. Developmental test and evaluation is a good example where more is learned about probability and consequences of failure in system designs. As we learn more about the risk events from developmental testing, we can then update our risk priorities and migrate to one of the other risk handling options such as control (including fixing the cause of the risk event), avoidance,

assumption and transfer. R&A is the precursor to the actual mitigation of risk and provides the logic and basis for the Program Definition and Risk Reduction (PDRR) phase of the life cycle.

4. *Risk Avoidance.* Remove the risk by trading off cost, schedule, or performance to the extent a risk event will not occur. Examples include performance threshold reductions, using more expensive material, or increasing the time allotted for an action..

5. *Risk Transfer.* Transfer the risk to some other element or organization usually with a cost, schedule, or performance trade-off. Examples include fixed price contracts and warranties, that transfer cost risk to the contractor (but not schedule or performance risk¹) in exchange for additional cost to the program, or a re-allocation of performance requirements from one program hardware or software element to another, possibly with a reduction in risk and an increase in cost.

Risk Monitoring/Reporting

Ideally, the risk monitoring system will be an integral part of an overall cost, schedule, performance, and program control system designed to support program management. This phase of the risk management process should interface with the earned value management system.

The objectives of the risk monitoring/reporting system are to:

- Re-assess risk upon detection of changes in the program or deviation between planned and actual results.
- Provide current risk information to support program decision makers.
- Ensure that risk stays within acceptable limits.

The risk monitoring system is targeted toward results from the application of risk handling options, monitoring those risk events that remain after application of risk handling options, and identification of unknown risk events yet to be detected. It should include the elements of an effective management control system and be designed to support the decision makers by providing only that information needed for the decision in a format tailored to the needs of the decision maker. It should include an identified standard and baseline, and a means to collect data to allow comparison of progress relative to that baseline.

For identified risk events, the control system should be targeted toward specific decisions, such as application of management reserve or activation of a contingency plan. It should be based on metrics that show whether the risk is increasing or decreasing. The type of control system used depends on the type of risk. For technical risks, Technical Performance Measurement (TPM) systems which specify the indicator, performance objectives, performance bands, and action limits are often effective. Cost and schedule variance tracking will usually be an effective means of monitoring. Major technical and program reviews are controls that should include a review of the risks which pertain to the decision under consideration. For example, the Integrated Baseline Review (IBR) is a key activity of the Monitoring and reporting Phase. The purpose of the IBR is to ensure the performance measurement baseline captures the entire technical scope of work; is consistent with contract schedule requirements; and has adequate resources assigned. It is

normally conducted by Program Manager no later than six months after contract award. The technical staff is heavily involved. The earned value management field command focal point and program office financial personnel will provide support to the program manager and technical staff during this review.

Program Risk Management Principles - A Summary. The following principles summarize the major lessons in this teaching note.

- The primary goals of program risk management are to support the development of the acquisition strategy to meet the user's need with the best balance of cost, schedule, performance, and risk, and to reduce the likelihood of failure by identifying risk events and dealing with them explicitly.
- Poor program planning will exacerbate a program's risk management efforts by establishing unrealistic objectives that do not recognize and account for program risk.
- Risk events must be dealt with and defined in terms of the probability of their occurrence and their effects (consequences) on cost, schedule, and performance.
- High, low, and moderate risk should also be defined in terms of probability of occurrence and cost, schedule, and performance consequences/impact.
- Risk can only be assessed within the context of an acquisition strategy. Change the acquisition strategy and you change the risk.
- Unless the original plan was sub-optimal, risk reduction will almost always involve trading off cost, schedule, and performance.
- Risk is defined in terms of Cost, Schedule, and Performance Risk. Under the “Cost as an Independent Variable” (CAIV) concept, as cost-performance tradeoffs (including risk) are made on an iterative basis, aggressive cost goals are established that become more of a constraint, and less of a variable. Therefore, the PM may reduce the costly impact imposed by the law of diminishing returns by trading marginal utility of performance to meet CAIV cost objectives.
- Risk can never be fully eliminated or completely transferred.
- The principal purpose of research and development is to reduce the uncertainty, and thereby the risk, associated with acquiring a new system.
- The default risk handling option in the absence of a quality risk management process is Assumption of risk.